

SEQUENCE LISTING



<110> JESTIN, JEAN-LUC
VICHIER-GUERRE, SOPHIE

<120> METHODS FOR OBTAINING THERMOSTABLE ENZYMES, DNA POLYMERASE I VARIANTS FROM THERMUS AQUATICUS HAVING NEW CATALYTIC ACTIVITIES, METHODS FOR OBTAINING THE SAME, AND APPLICATIONS OF THE SAME

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<141> 2004-02-27

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<170> PatentIn version 3.3

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 <212> PRT
 <213> *Thermus aquaticus*
 <400> 22

Met	Ala	Ser	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
1														15

Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
														30
20														

Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	Leu	Ala	Leu
35														

Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	Pro	Tyr	Lys	Ala
50															

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Gly Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Thr Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 23
<211> 1688
<212> DNA
<213> *Thermus aquaticus*

<400> 23
ccatggcctc tggggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60
ccccctggcc cccgccccgaa ggggccttcg tgggctttgt gcttcccgca aaggagccca 120
tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cggggccccc 180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240
gcgttctggc cctgagggaa ggccttggcc tcccggccgg cgacgacccc atgctcctcg 300
cctaccccttcc ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgaaa 360
agtggacgga ggaggcgaaa gagcgcccg ccctttccga gaggctttc gccaacctgt 420
gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 480
tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca 540
gggccttgtc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgccc 600

tggccggcca	ccccttccaa	ctcaaccaac	gggaccagct	ggaaagggtc	ctcttgacg	660
agcttagggct	tcccgccatc	ggcaagacgg	agaagaccgg	caagcgctcc	accagcgccg	720
ccgtccttgg	ggccctccgc	gaggcccacc	ccatcgttgg	gaagatcctg	cagtaccggg	780
agctcaacaa	gctgaagagc	acccaaat	ctcagttgcc	ggacctcatc	cacccca	840
cgggcccgc	ccacacccgc	ttcaaccaga	cggccacgca	aacgggcagg	ctaagttagct	900
cccagccaa	cctccagaac	atccccgtcc	gcaccccgct	tgggcagagg	atccgcccgg	960
ccttcatcgc	cgaggagggg	aggctattgg	tggcccttgg	ctataaccag	atagagctca	1020
gggtgctggc	ccacctctcc	ggcgacgaga	acctgatccg	ggtcttccag	gaggggcggg	1080
acatccacac	ggagaccgccc	agctggatgt	tcggcgtccc	ccgggaggcc	gtggaccccc	1140
tgtatgcgcg	ggcggccaag	accatcaact	tcggggtcct	ctacggcatg	tcggcccacc	1200
gcctctccca	ggagctagcc	atcccttacg	aggaggccca	ggccttcatt	gagcgctact	1260
ttcagagctt	ccccaaagg	tgcccttgg	ttgagaagac	cctggaggag	ggcaggaggc	1320
gggggtacgt	ggagaccctc	ttcggccgccc	gccgctacct	gccagaccta	gaggcccagg	1380
tgaagaatgt	gcgggaggcg	gccgagcgca	gggccttcaa	catgcccgtc	cagggcaccg	1440
ccgcccac	catgaagctg	gctatggtga	agctttccc	caggctggag	gaaatggggg	1500
ccagggatgct	ccttcagg	cacgacgagc	tggcctcga	ggccccaaaa	gagggggcgg	1560
aggccgtggc	ccggctggcc	aaggagg	tggaggggt	gtatcccctg	gccgtgcctc	1620
tggaggttgg	ggtggggata	ggggaggact	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 24
 <211> 562
 <212> PRT
 <213> *Thermus aquaticus*

<400> 24

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala
 1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Gln Leu Asn
195 200 205

Gln Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Asn Lys Leu Lys Ser Thr Gln Ile Thr Gln Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Gln Thr Gly Arg Leu Ser Ser Ser Gln Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Thr
305 310 315 320

Phe Ile Ala Glu Glu Gly Arg Leu Leu Val Ala Leu Asp Tyr Asn Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Leu Pro Asp Leu Glu Ala Gln Val Lys Asn Val Arg
450 455 460

Glu Ala Ala Glu Arg Arg Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 25
<211> 1688
<212> DNA
<213> *Thermus aquaticus*

<400> 25
ccatggcctc tggggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60
ccccctggcc cccgccccaa ggggccttcg tggctttgt gctttccgc aaggagccca 120
tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240

gcgttctggc cctgagggaa ggccttggcc tcccgcggcg cgacgacccc atgctcctcg	300
cctacaccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgaaa	360
agtggacgga ggaggcgaaa gagcgggccc ccctttccga gaggctcttc gccaacctgt	420
gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc	480
tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca	540
gggccttgtc cctggaggtg gccgaggaga tcgcccgcct cgaggccgag gtcttccgccc	600
tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctctttgacg	660
agcttagggct tcccgcacatc ggcaagacgg agaagacccgg caagcgctcc accagcgccg	720
ccgtcctgga ggccctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg	780
agctcaccaa gctgaagagc acctacattt accccttgcgg gacactcatc caccccaagga	840
cgggccgcct ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct	900
ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg	960
ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca	1020
gggtgctggc ccacctctcc ggacgacgaga acctgatccg ggtcttccag gagggggcggg	1080
acatccacac ggagacccgc agctggatgt tcggcgtccc cggggaggcc gtggacccccc	1140
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tgaagagcgt gcgggaggcg gccgagcgca tggccttcaa catgcccgtc cagggcacccg	1440
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ccagggatgt ctttcagggtc cacgacgagc tggcctcga ggccccaaaa gagagggcgg	1560
aggccgtggc ccggctggcc aaggaggta tggaggggggt gtatcccctg gccgtgcccc	1620
tggaggtgga ggtggggata gggaggact ggctctccgc caaggaggcg gccgcactgg	1680
tgccgcgc	1688

<210> 26
<211> 562
<212> PRT
<213> *Thermus aquaticus*

<400> 26

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Arg Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<211> 1688
 <212> DNA
 <213> Thermus aquaticus

<400> 27
 ccatggcctc tgggtggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60
 cccccctggcc cccgccccaa ggggccttcg tgggtttgt gctttcccg aaggagccca 120
 tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cggggccccc 180
 agccttataa agccctcagg gacctgaagg aggcgccgggg gcttctcgcc aaagacctga 240
 gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg 300
 cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgggg 360
 agtggacgga ggaggcgggg gagcgggccc ccctttccga gaggctctc gccaacctgt 420
 gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 480
 tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca 540
 gggccttgtc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgcc 600
 tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctcttgacg 660
 agctagggtc tcccgccatc ggcaagacgg agaagacccg caagcgctcc accagcgccg 720
 tcgtcctgga ggccctccgc gaggcccacc ccatcgtgga gaagatcctg cagtaccggg 780
 agctcaccaa gctgaagagc acctacattt accccttgcc ggacctcatc caccccgagga 840
 cgggcccctt ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct 900
 ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg 960
 ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca 1020
 gggtgctggc ccacctctcc ggcgacgaga acctgatccg ggtcttccag gagggcgggg 1080
 acatccacac ggagacccgc agctggatgt tcggcgtccc ccgggaggcc gtggacccccc 1140
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 gcctctccca ggagctagcc atcccttacg aggaggccca ggccttcatt gagcgctact 1260
 ttcagagctt ccccaaggtg cgggcctgga ttgagaagac cctggaggag ggcaggaggc 1320
 gggggtagt ggagaccctc ttcggccgccc gccgctacgt gccagaccta gagggccggg 1380

tgaagagcgt	gcgggaggcg	gccgagcgca	tggcttcaa	catgcccgtc	cagggcacccg	1440
ccgcccacct	catgaagctg	gctatggtga	agctctcccc	caggctggag	gaaatggggg	1500
ccaggatgct	ccttcaggc	cacgacgagc	tggtcctcga	ggcccaaaa	gagggggcgg	1560
aggccgtggc	ccggctggcc	aaggaggtca	tggagggggt	gtatcccctg	gccgtgcccc	1620
tggaggtgga	ggtgggata	ggggaggacc	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 28
 <211> 562
 <212> PRT
 <213> *Thermus aquaticus*

<400> 28

Met	Ala	Ser	Gly	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
1							5				10			15	

Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
									20			25		30	

Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	Leu	Ala	Leu	Ala
							35			40			45		

Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	Pro	Tyr	Lys	Ala
						50				55		60			

Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala	Lys	Asp	Leu	Ser
					65				70			75		80	

Val	Leu	Ala	Leu	Arg	Glu	Gly	Leu	Gly	Leu	Pro	Pro	Gly	Asp	Asp	Pro
							85			90			95		

Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro	Ser	Asn	Thr	Thr	Pro	Glu	Gly
							100			105			110		

Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp	Thr	Glu	Glu	Ala	Gly	Glu	Arg
							115			120			125		

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Val
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Ser Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Ser Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val

530

535

540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
 545 550 555 560

Pro Arg

<210> 29
 <211> 1688
 <212> DNA
 <213> *Thermus aquaticus*

<400> 29
 ccatggcctc tggtggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60
 cccctggcc cccgccccaa ggggccttcg tgggcttgc gctttccgc aaggagccca 120
 tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cggggccccc 180
 agccttataa agccctcagg gacctgaagg aggcgccccg gcttctcgcc aaagacctga 240
 gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg 300
 cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgaaa 360
 agtggacgga ggaggcgaaa gagcggggccg cccttcgaa gaggcttttc gccaacctgt 420
 gggggaggct tgagggggag gagaggctcc tttggctta ccgggaggtg gagaggcccc 480
 tttccgctgt cctggcccac atggaggcca cgggggtgcg cctggacgtg gcctatctca 540
 gggccttgtc cctggaggtg gccgaggaga tcgccccct cgaggccgag gtcttccgccc 600
 tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctcttgacg 660
 agctagggtc tcccgccatc ggcaagacgg agaagacccg caagcgctcc accagcgccg 720
 ccgtccttggaa ggccctccgc gaggcccacc ccatcgttggaa gaagatcctg cagtaccggg 780
 agctcaccaa gctgaagagc acctacatttgc accccttgcgg ggacctcatc caccccgagg 840
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 ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccggccggg 960
 ctttcatcgc cgaggagggg tggctattgg tggcccttggaa ctatagccag atagagctca 1020

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tgatgcgccc	ggcggccaag	accatcaact	tcggggtcct	ctacggcatg	tcggcccacc	1200
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ccagggatgct	ccttcaggc	cacgacgagc	tggcctcga	ggccccaaaa	gagggggcgg	1560
aggccgtggc	ccggctggcc	aaggaggtca	tggaggggt	gtatcccctg	gccgtgcccc	1620
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tgccgcgc						1688

<210> 30
 <211> 562
 <212> PRT
 <213> *Thermus aquaticus*

<400> 30

Met	Ala	Ser	Gly	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
1														15	

Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
														30	

Val	Leu	Ser	Arg	Lys	Glu	Pro	Met	Trp	Ala	Asp	Leu	Leu	Ala	Leu	Ala
														35	

Ala	Ala	Arg	Gly	Gly	Arg	Val	His	Arg	Ala	Pro	Glu	Pro	Tyr	Lys	Ala
														50	

Leu	Arg	Asp	Leu	Lys	Glu	Ala	Arg	Gly	Leu	Leu	Ala	Lys	Asp	Leu	Ser
														65	

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Val Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu

485

490

495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 31
<211> 1688
<212> DNA
<213> *Thermus aquaticus*

<400> 31
ccatggcctc tggggcggt ggctgtggtg ggggtggcag ccccaaggcc ctggaggagg 60
ccccctggcc cccgccccaa ggggccttcg tgggcttgc gctttccgc aaggagccca 120
tgtggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180
agccttataa agccctcagg gacctgaagg aggccgggg gcttctcgcc aaagacctga 240
gcgttctggc cctgagggaa ggccttggcc tcccgccccg cgacgacccc atgctcctcg 300
cctaccccttcc ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgggg 360
agtggacgga ggaggccggg gagccggccg ccctttccga gaggctttc gccaacctgt 420
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tggccggcca ccccttcaac ctcaactccc gggaccagct ggaaagggtc ctctttgacg 660

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agctcaccaa	gctgaagagc	acctacattg	acccttgcc	ggacctcatc	caccccagga	840
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acatccacac	ggagaccgccc	agctggatgt	tcggcgtccc	ccgggaggcc	gtggacccccc	1140
tgatgcgccc	ggcggccaag	accatcaact	tcggggtcct	ctacggcatg	tcggcccacc	1200
gcctctccca	ggagctagcc	atcccttacg	aggaggccca	ggccttcatt	gagcgctact	1260
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ccaggatgct	ccttcaggtc	cacgacgagc	tggcctcga	ggccccaaaa	gagggggcgg	1560
aggccgtggc	ccggctggcc	aaggaggta	tggaggggg	gtatcccctg	gccgtgcccc	1620
tggaggtgga	ggtgggata	ggggaggacc	ggctctccgc	caaggaggcg	gccgcactgg	1680
tgccgcgc						1688

<210> 32
 <211> 562
 <212> PRT
 <213> *Thermus aquaticus*
 <400> 32

Met	Ala	Ser	Gly	Gly	Gly	Gly	Cys	Gly	Gly	Gly	Gly	Ser	Pro	Lys	Ala
1							5					10			15

Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Glu	Gly	Ala	Phe	Val	Gly	Phe
											20		25		30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly

435

440

445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Arg Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 33
<211> 1688
<212> DNA
<213> *Thermus aquaticus*

<400> 33
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tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga 240
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cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgaaa	360
agtggacgga ggaggcgaaa gagcggcccg ccctttccga gaggctcttc gccaacctgt	420
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ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccggccggg	960
ccttcatcgc cgaggagggg tggctattgg tggccctgga ctatagccag atagagctca	1020
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aggccgtggc ccggctggcc aaggaggta tggaggggggt gtatccctg gccgtgctcc	1620
tggaggtgga ggtggggata ggggaggact ggctctccgc caaggaggcg gccgcactgg	1680
tgccgcgc	1688

<210> 34
<211> 562

<212> PRT

<213> *Thermus aquaticus*

<400> 34

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg

385

390

395

400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Leu Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Lys Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Leu Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 35

<211> 1688

<212> DNA

<213> Thermus aquaticus

<400> 35	
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ccccctggcc cccgccccaa ggggccttcg tgggcttgt gctttcccg aaggagccca	120
tgtgggccga tcttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg	180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gcttctcgcc aaagacctga	240
gcgttctggc cctgagggaa ggccttggcc tcccggccgg cgacgacccc atgctcctcg	300
cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccggcgc tacggcgaaa	360
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ccgtccttggaa ggccctccgc gaggcccacc ccatcgttggaa gaagatcctg cagtaccggg	780
agctcaccaa gctgaagagc acctacattt accccttgcgttca ggacccatc caccggatgt	840
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ccgatcccaa cctccagaac atccccgtcc gcaccccgct tggcagagg atccggccggg	960
ccttcatcgc cgaggaggaaa tggctattgg tggcccttggaa ctatagccag atagagctca	1020
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cccgatgct cttcaggc cacgacgagc tggcctcga ggccccaaaa gagggggcgg 1560
aggccgtggc ccggctggcc aaggaggta tggagggggt gtatcccctg gccgtgcccc 1620
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tgccgcgc 1688

<210> 36
<211> 562
<212> PRT
<213> *Thermus aquaticus*

<400> 36

Met Ala Ser Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Gln Asp Leu Ile His Pro Ser Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu
290 295 300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile

340

345

350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Glu Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Tyr Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Ala Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 37
<211> 1688
<212> DNA
<213> *Thermus aquaticus*

<400> 37
ccatggcctc tggggcggt ggctgtggtg gcgggtggcag ccccaaggcc ctggaggagg 60
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tgtggccga tttctggcc ctggccgccc ccaggggggg ccgggtccac cgggcccccg 180
agccttataa agccctcagg gacctgaagg aggcgcgaaa gtttctcgcc aaagacactga 240
gcgttctggc cctgaggaa ggccttggcc tcccgcccg cgacgacccc atgctcctcg 300
cctacccctt ggacccttcc aacaccaccc ccgaggggggt ggcccgccgc tacggcgaaa 360
agtggacgga ggaggcgaaa gagcggcccg cccttccga gaggctttc gccaacctgt 420
gggggaggct tgagggggag gagaggctcc tttggctta cggggaggtg gagaggcccc 480
tttccgctgt cctggccac atggaggcca cgggggtgcg cttggacgtg gcctatctca 540
gggccttgc cctggaggta gccgaggaga tcgccccctt cgaggccgag gtcttccgccc 600
tggccggcca ccccttcaac ctcaactccc gggaccagct gaaaagggtc ctcttgacg 660
agctagggt tcccgccatc ggcaagacgg agaagaccgg caagcgctcc accagcgccg 720
ccgtcctgga ggcctccgc gaggccacc ccatcgtgga gaagatcctg cagtaccggg 780
agctcaccaa gctgaagagc acctacattt accccttgcc ggacctcatc caccccgaaa 840
cgggccgcct ccacacccgc ttcaaccaga cggccacggc cacgggcagg ctaagtagct 900
ccgatcccaa cttccagaac atccccgtcc gcaccccgct tggcagagg atccgcccggg 960
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acatccacac ggagaccggc agctggatgt tcggcgtccc ccgggaggcc gtggacccccc 1140

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ccgcccacct cgtgaagctg gctatggtga agctttccc caggctggag gaaatggggg 1500
ccagggatgct cttcaggc acgacgagc tggcctcga ggccccaaaa gaggggggcgg 1560
aggccgtggc ccggctggcc aaggaggta tggagggggt gtatcccctg gccgtgcccc 1620
tggaggtgga ggtgggata gggaggact ggctctccgc caaggaggcg gccgcactgg 1680
tgccgcgc 1688

<210> 38
<211> 562
<212> PRT
<213> *Thermus aquaticus*

<400> 38

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly Ser Pro Lys Ala
1 5 10 15

Leu Glu Glu Ala Pro Trp Pro Pro Pro Glu Gly Ala Phe Val Gly Phe
20 25 30

Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp Leu Leu Ala Leu Ala
35 40 45

Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro Glu Pro Tyr Lys Ala
50 55 60

Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu Ala Lys Asp Leu Ser
65 70 75 80

Val Leu Ala Leu Arg Glu Gly Leu Gly Leu Pro Pro Gly Asp Asp Pro
85 90 95

Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn Thr Thr Pro Glu Gly
100 105 110

Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu Glu Ala Gly Glu Arg
115 120 125

Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu Trp Gly Arg Leu Glu
130 135 140

Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu Val Glu Arg Pro Leu
145 150 155 160

Ser Ala Val Leu Ala His Met Glu Ala Thr Gly Val Arg Leu Asp Val
165 170 175

Ala Tyr Leu Arg Ala Leu Ser Leu Glu Val Ala Glu Glu Ile Ala Arg
180 185 190

Leu Glu Ala Glu Val Phe Arg Leu Ala Gly His Pro Phe Asn Leu Asn
195 200 205

Ser Arg Asp Gln Leu Glu Arg Val Leu Phe Asp Glu Leu Gly Leu Pro
210 215 220

Ala Ile Gly Lys Thr Glu Lys Thr Gly Lys Arg Ser Thr Ser Ala Ala
225 230 235 240

Val Leu Glu Ala Leu Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu
245 250 255

Gln Tyr Arg Glu Leu Thr Lys Leu Lys Ser Thr Tyr Ile Asp Pro Leu
260 265 270

Pro Asp Leu Ile His Pro Arg Thr Gly Arg Leu His Thr Arg Phe Asn
275 280 285

Gln Thr Ala Thr Ala Thr Gly Arg Leu Ser Ser Ser Asp Pro Asn Leu

290

295

300

Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile Arg Arg Ala
305 310 315 320

Phe Ile Ala Glu Glu Gly Trp Leu Leu Val Ala Leu Asp Tyr Ser Gln
325 330 335

Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu Asn Leu Ile
340 345 350

Arg Val Phe Gln Glu Gly Arg Asp Ile His Thr Glu Thr Ala Ser Trp
355 360 365

Met Phe Gly Val Pro Arg Glu Ala Val Asp Pro Leu Met Arg Arg Ala
370 375 380

Ala Lys Thr Ile Asn Phe Gly Val Leu Tyr Gly Met Ser Ala His Arg
385 390 395 400

Leu Ser Gln Glu Leu Ala Ile Pro Tyr Glu Glu Ala Gln Ala Phe Ile
405 410 415

Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp Ile Glu Lys
420 425 430

Thr Leu Glu Glu Gly Arg Arg Gly Tyr Val Glu Thr Leu Phe Gly
435 440 445

Arg Arg Arg Tyr Val Pro Asp Leu Glu Ala Arg Val Lys Ser Val Arg
450 455 460

Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln Gly Thr Ala
465 470 475 480

Ala Asp Leu Val Lys Leu Ala Met Val Lys Leu Phe Pro Arg Leu Glu
485 490 495

Glu Met Gly Ala Arg Met Leu Leu Gln Val His Asp Glu Leu Val Leu
500 505 510

Glu Ala Pro Lys Glu Gly Ala Glu Ala Val Ala Arg Leu Ala Lys Glu
515 520 525

Val Met Glu Gly Val Tyr Pro Leu Ala Val Pro Leu Glu Val Glu Val
530 535 540

Gly Ile Gly Glu Asp Trp Leu Ser Ala Lys Glu Ala Ala Ala Leu Val
545 550 555 560

Pro Arg

<210> 39
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 39

Met Ala Ser Gly Gly Gly Gly Cys Gly Gly Gly
1 5 10

<210> 40
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 40

Ala Ala Ala Leu Val Pro Arg Gly Ser Leu Glu His His His His His
1 5 10 15

His

<210> 41
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 41

Met Lys Tyr Leu Leu Pro Thr Ala Ala Ala Gly Leu Leu Leu Leu Ala
1 5 10 15

Ala Gln Pro Ala Met Ala
20

<210> 42
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 42

Met Lys Thr Leu Leu Ala Met Val Leu Val Gly Leu Leu Leu Leu Pro
1 5 10 15

Pro Gly Pro Ser Met Ala
20

<210> 43
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 43

Met Arg Gly Leu Leu Ala Met Leu Val Ala Gly Leu Leu Leu Leu Pro
1 5 10 15

Ile Ala Pro Ala Met Ala
20

<210> 44
<211> 21
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 44

Met Arg Arg Leu Leu Val Ile Ala Ala Gly Leu Leu Leu Leu Ala
1 5 10 15

Pro Pro Thr Met Ala
20

<210> 45
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic DNA

<400> 45
gcggccgcac tggtgccgca cgccagcctc gag

33

<210> 46
<211> 148
<212> PRT
<213> Homo sapiens

<400> 46

Ala Asp Gln Leu Thr Glu Glu Gln Ile Ala Glu Phe Lys Glu Ala Phe
1 5 10 15

Ser Leu Phe Asp Lys Asp Gly Asp Gly Thr Ile Thr Thr Lys Glu Leu
20 25 30

Gly Thr Val Met Arg Ser Leu Gly Gln Asn Pro Thr Glu Ala Glu Leu
35 40 45

Gln Asp Met Ile Asn Glu Val Asp Ala Asp Gly Asn Gly Thr Ile Asp
50 55 60

Phe Pro Glu Phe Leu Thr Met Met Ala Arg Lys Met Lys Asp Thr Asp
65 70 75 80

Ser Glu Glu Glu Ile Arg Glu Ala Phe Arg Val Phe Asp Lys Asp Gly
85 90 95

Asn Gly Tyr Ile Ser Ala Ala Glu Leu Arg His Val Met Thr Asn Leu
100 105 110

Gly Glu Lys Leu Thr Asp Glu Glu Val Asp Glu Met Ile Arg Glu Ala
115 120 125

Asp Ile Asp Gly Asp Gly Gln Val Asn Tyr Glu Glu Phe Val Gln Met
130 135 140

Met Thr Ala Lys
145

<210> 47
<211> 114
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic DNA

<400> 47

Gln Val Gln Leu Gln Gln Ser Gly Pro Glu Asp Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Tyr Met Asn Trp Val Lys Gln Ser Pro Gly Lys Gly Leu Glu Trp Ile
35 40 45

Gly Asp Ile Asn Pro Asn Asn Gly Gly Thr Ser Tyr Asn Gln Lys Phe
50 55 60

Lys Gly Arg Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Arg Ser Leu Thr Ser Glu Asp Ser Ser Val Tyr Tyr Cys
85 90 95

Glu Ser Gln Ser Gly Ala Tyr Trp Gly Gln Gly Thr Thr Val Thr Val
100 105 110

Ser Ala

<210> 48
<211> 20
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 48

Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Gly
1 5 10 15

Gly Gly Gly Ser
20

<210> 49
<211> 116
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Peptide

<400> 49

Asp Tyr Lys Asp Ile Leu Met Thr Gln Thr Pro Ser Ser Leu Pro Val
1 5 10 15

Ser Leu Gly Asp Gln Ala Ser Ile Ser Cys Arg Ser Ser Gln Ser Ile
20 25 30

Val His Ser Asn Gly Asn Thr Tyr Leu Glu Trp Tyr Leu Gln Lys Pro
35 40 45

Gly Gln Ser Pro Lys Leu Leu Ile Tyr Lys Val Ser Asn Arg Phe Ser
50 55 60

Gly Val Pro Asp Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr
65 70 75 80

Leu Lys Ile Ser Arg Val Glu Ala Glu Asp Leu Gly Val Tyr Tyr Cys
85 90 95

Phe Gln Gly Ser His Val Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu
100 105 110

Glu Ile Lys Arg
115

<210> 50
<211> 291
<212> PRT
<213> *Thermus thermophilus*

<400> 50

Met Glu Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu
1 5 10 15

Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly
20 25 30

Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala
35 40 45

Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe
50 55 60

Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu
65 70 75 80

Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln
85 90 95

Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu
100 105 110

Glu Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys
115 120 125

Lys Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg
130 135 140

Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu
145 150 155 160

Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Arg
165 170 175

Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp
180 185 190

Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu
195 200 205

Leu Lys Glu Trp Gly Ser Leu Glu Asn Leu Leu Lys Asn Leu Asp Arg
210 215 220

Val Lys Pro Glu Asn Val Arg Glu Lys Ile Lys Ala His Leu Glu Asp
225 230 235 240

Leu Arg Leu Ser Leu Glu Leu Ser Arg Val Arg Thr Asp Leu Pro Leu
245 250 255

Glu Val Asp Leu Ala Gln Gly Arg Glu Pro Asp Arg Glu Gly Leu Arg

260

265

270

Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly
275 280 285

Leu Leu Glu
290

<210> 51
<211> 196
<212> PRT
<213> Escherichia coli

<400> 51

Val Ile Ser Tyr Asp Asn Tyr Val Thr Ile Leu Asp Glu Glu Thr Leu
1 5 10 15

Lys Ala Trp Ile Ala Lys Leu Glu Lys Ala Pro Val Phe Ala Phe Asp
20 25 30

Thr Glu Thr Asp Ser Leu Asp Asn Ile Ser Ala Asn Leu Val Gly Leu
35 40 45

Ser Phe Ala Ile Glu Pro Gly Val Ala Ala Tyr Ile Pro Val Ala His
50 55 60

Asp Tyr Leu Asp Ala Pro Asp Gln Ile Ser Arg Glu Arg Ala Leu Glu
65 70 75 80

Leu Leu Lys Pro Leu Leu Glu Asp Glu Lys Ala Leu Lys Val Gly Gln
85 90 95

Asn Leu Lys Tyr Asp Arg Gly Ile Leu Ala Asn Tyr Gly Ile Glu Leu
100 105 110

Arg Gly Ile Ala Phe Asp Thr Met Leu Glu Ser Tyr Ile Leu Asn Ser
115 120 125

Val Ala Gly Arg His Asp Met Asp Ser Leu Ala Glu Arg Trp Leu Lys

130

135

140

His Lys Thr Ile Thr Phe Glu Glu Ile Ala Gly Lys Gly Lys Asn Gln
145 150 155 160

Leu Thr Phe Asn Gln Ile Ala Leu Glu Glu Ala Gly Arg Tyr Ala Ala
165 170 175

Glu Asp Ala Asp Val Thr Leu Gln Leu His Leu Lys Met Trp Pro Asp
180 185 190

Leu Gln Lys His
195

<210> 52
<211> 686
<212> PRT
<213> *Bacillus circulans*

<400> 52

Ala Pro Asp Thr Ser Val Ser Asn Lys Gln Asn Phe Ser Thr Asp Val
1 5 10 15

Ile Tyr Gln Ile Phe Thr Asp Arg Phe Ser Asp Gly Asn Pro Ala Asn
20 25 30

Asn Pro Thr Gly Ala Ala Phe Asp Gly Thr Cys Thr Asn Leu Arg Leu
35 40 45

Tyr Cys Gly Gly Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly
50 55 60

Tyr Leu Thr Gly Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val
65 70 75 80

Glu Asn Ile Tyr Ser Ile Ile Asn Tyr Ser Gly Val Asn Asn Thr Ala
85 90 95

Tyr His Gly Tyr Trp Ala Arg Asp Phe Lys Lys Thr Asn Pro Ala Tyr

100

105

110

Gly Thr Ile Ala Asp Phe Gln Asn Leu Ile Ala Ala Ala His Ala Lys
115 120 125

Asn Ile Lys Val Ile Asp Phe Ala Pro Asn His Thr Ser Pro Ala
130 135 140

Ser Ser Asp Gln Pro Ser Phe Ala Glu Asn Gly Arg Leu Tyr Asp Asn
145 150 155 160

Gly Thr Leu Leu Gly Gly Tyr Thr Asn Asp Thr Gln Asn Leu Phe His
165 170 175

His Asn Gly Gly Thr Asp Phe Ser Thr Thr Glu Asn Gly Ile Tyr Lys
180 185 190

Asn Leu Tyr Asp Leu Ala Asp Leu Asn His Asn Asn Ser Thr Val Asp
195 200 205

Val Tyr Leu Lys Asp Ala Ile Lys Met Trp Leu Asp Leu Gly Ile Asp
210 215 220

Gly Ile Arg Met Asp Ala Val Lys His Met Pro Phe Gly Trp Gln Lys
225 230 235 240

Ser Phe Met Ala Ala Val Asn Asn Tyr Lys Pro Val Phe Thr Phe Gly
245 250 255

Glu Trp Phe Leu Gly Val Asn Glu Val Ser Pro Glu Asn His Lys Phe
260 265 270

Ala Asn Glu Ser Gly Met Ser Leu Leu Asp Phe Arg Phe Ala Gln Lys
275 280 285

Val Arg Gln Val Phe Arg Asp Asn Thr Asp Asn Met Tyr Gly Leu Lys
290 295 300

Ala Met Leu Glu Gly Ser Ala Ala Asp Tyr Ala Gln Val Asp Asp Gln
305 310 315 320

Val Thr Phe Ile Asp Asn His Asp Met Glu Arg Phe His Ala Ser Asn
325 330 335

Ala Asn Arg Arg Lys Leu Glu Gln Ala Leu Ala Phe Thr Leu Thr Ser
340 345 350

Arg Gly Val Pro Ala Ile Tyr Tyr Gly Thr Glu Gln Tyr Met Ser Gly
355 360 365

Gly Thr Asp Pro Asp Asn Arg Ala Arg Ile Pro Ser Phe Ser Thr Ser
370 375 380

Thr Thr Ala Tyr Gln Val Ile Gln Lys Leu Ala Pro Leu Arg Lys Cys
385 390 395 400

Asn Pro Ala Ile Ala Tyr Gly Ser Thr Gln Glu Arg Trp Ile Asn Asn
405 410 415

Asp Val Leu Ile Tyr Glu Arg Lys Phe Gly Ser Asn Val Ala Val Val
420 425 430

Ala Val Asn Arg Asn Leu Asn Ala Pro Ala Ser Ile Ser Gly Leu Val
435 440 445

Thr Ser Leu Pro Gln Gly Ser Tyr Asn Asp Val Leu Gly Gly Leu Leu
450 455 460

Asn Gly Asn Thr Leu Ser Val Gly Ser Gly Gly Ala Ala Ser Asn Phe
465 470 475 480

Thr Leu Ala Ala Gly Gly Thr Ala Val Trp Gln Tyr Thr Ala Ala Thr
485 490 495

Ala Thr Pro Thr Ile Gly His Val Gly Pro Met Met Ala Lys Pro Gly
500 505 510

Val Thr Ile Thr Ile Asp Gly Arg Gly Phe Gly Ser Ser Lys Gly Thr
515 520 525

Val Tyr Phe Gly Thr Thr Ala Val Ser Gly Ala Asp Ile Thr Ser Trp
530 535 540

Glu Asp Thr Gln Ile Lys Val Lys Ile Pro Ala Val Ala Gly Gly Asn
545 550 555 560

Tyr Asn Ile Lys Val Ala Asn Ala Ala Gly Thr Ala Ser Asn Val Tyr
565 570 575

Asp Asn Phe Glu Val Leu Ser Gly Asp Gln Val Ser Val Arg Phe Val
580 585 590

Val Asn Asn Ala Thr Thr Ala Leu Gly Gln Asn Val Tyr Leu Thr Gly
595 600 605

Ser Val Ser Glu Leu Gly Asn Trp Asp Pro Ala Lys Ala Ile Gly Pro
610 615 620

Met Tyr Asn Gln Val Val Tyr Gln Tyr Pro Asn Trp Tyr Tyr Asp Val
625 630 635 640

Ser Val Pro Ala Gly Lys Thr Ile Glu Phe Lys Phe Leu Lys Lys Gln
645 650 655

Gly Ser Thr Val Thr Trp Glu Gly Ser Asn His Thr Phe Thr Ala
660 665 670

Pro Ser Ser Gly Thr Ala Thr Ile Asn Val Asn Trp Gln Pro
675 680 685

<210> 53
<211> 399
<212> PRT
<213> *Bordetella pertussis*

<400> 53

Met Gln Gln Ser His Gln Ala Gly Tyr Ala Asn Ala Ala Asp Arg Glu
1 5 10 15

Ser Gly Ile Pro Ala Ala Val Leu Asp Gly Ile Lys Ala Val Ala Lys
20 25 30

Glu Lys Asn Ala Thr Leu Met Phe Arg Leu Val Asn Pro His Ser Thr
35 40 45

Ser Leu Ile Ala Glu Gly Val Ala Thr Lys Gly Leu Gly Val His Ala
50 55 60

Lys Ser Ser Asp Trp Gly Leu Gln Ala Gly Tyr Ile Pro Val Asn Pro
65 70 75 80

Asn Leu Ser Lys Leu Phe Gly Arg Ala Pro Glu Val Ile Ala Arg Ala
85 90 95

Asp Asn Asp Val Asn Ser Ser Leu Ala His Gly His Thr Ala Val Asp
100 105 110

Leu Thr Leu Ser Lys Glu Arg Leu Asp Tyr Leu Arg Gln Ala Gly Leu
115 120 125

Val Thr Gly Met Ala Asp Gly Val Val Ala Ser Asn His Ala Gly Tyr
130 135 140

Glu Gln Phe Glu Phe Arg Val Lys Glu Thr Ser Asp Gly Arg Tyr Ala
145 150 155 160

Val Gln Tyr Arg Arg Lys Gly Gly Asp Asp Phe Glu Ala Val Lys Val
165 170 175

Ile Gly Asn Ala Ala Gly Ile Pro Leu Thr Ala Asp Ile Asp Met Phe
180 185 190

Ala Ile Met Pro His Leu Ser Asn Phe Arg Asp Ser Ala Arg Ser Ser
195 200 205

Val Thr Ser Gly Asp Ser Val Thr Asp Tyr Leu Ala Arg Thr Arg Arg
210 215 220

Ala Ala Ser Glu Ala Thr Gly Gly Leu Asp Arg Glu Arg Ile Asp Leu
225 230 235 240

Leu Trp Lys Ile Ala Arg Ala Gly Ala Arg Ser Ala Val Gly Thr Glu
245 250 255

Ala Arg Arg Gln Phe Arg Tyr Asp Gly Asp Met Asn Ile Gly Val Ile
260 265 270

Thr Asp Phe Glu Leu Glu Val Arg Asn Ala Leu Asn Arg Arg Ala His
275 280 285

Ala Val Gly Ala Gln Asp Val Val Gln His Gly Thr Glu Gln Asn Asn
290 295 300

Pro Phe Pro Glu Ala Asp Glu Lys Ile Phe Val Val Ser Ala Thr Gly
305 310 315 320

Glu Ser Gln Met Leu Thr Arg Gly Gln Leu Lys Glu Tyr Ile Gly Gln
325 330 335

Gln Arg Gly Glu Gly Tyr Val Phe Tyr Glu Asn Arg Ala Tyr Gly Val
340 345 350

Ala Gly Lys Ser Leu Phe Asp Asp Gly Leu Gly Ala Ala Pro Gly Val
355 360 365

Pro Ser Gly Arg Ser Lys Phe Ser Pro Asp Val Leu Glu Thr Val Pro
370 375 380

Ala Ser Pro Gly Leu Arg Arg Pro Ser Leu Gly Ala Val Glu Arg
385 390 395

<211> 275

<212> PRT

<213> *Bacillus amyloliquefaciens*

<400> 54

Ala Gln Ser Val Pro Tyr Gly Val Ser Gln Ile Lys Ala Pro Ala Leu
1 5 10 15

His Ser Gln Gly Tyr Thr Gly Ser Asn Val Lys Val Ala Val Ile Asp
20 25 30

Ser Gly Ile Asp Ser Ser His Pro Asp Leu Lys Val Ala Gly Gly Ala
35 40 45

Ser Met Val Pro Ser Glu Thr Asn Pro Phe Gln Asp Asn Asn Ser His
50 55 60

Gly Thr His Val Ala Gly Thr Val Ala Ala Leu Asn Asn Ser Ile Gly
65 70 75 80

Val Leu Gly Val Ala Pro Ser Ala Ser Leu Tyr Ala Val Lys Val Leu
85 90 95

Gly Ala Asp Gly Ser Gly Gln Tyr Ser Trp Ile Ile Asn Gly Ile Glu
100 105 110

Trp Ala Ile Ala Asn Asn Met Asp Val Ile Asn Met Ser Leu Gly Gly
115 120 125

Pro Ser Gly Ser Ala Ala Leu Lys Ala Ala Val Asp Lys Ala Val Ala
130 135 140

Ser Gly Val Val Val Val Ala Ala Ala Gly Asn Glu Gly Thr Ser Gly
145 150 155 160

Ser Ser Ser Thr Val Gly Tyr Pro Gly Lys Tyr Pro Ser Val Ile Ala
165 170 175

Val Gly Ala Val Asp Ser Ser Asn Gln Arg Ala Ser Phe Ser Ser Val

180

185

190

Gly Pro Glu Leu Asp Val Met Ala Pro Gly Val Ser Ile Gln Ser Thr
195 200 205

Leu Pro Gly Asn Lys Tyr Gly Ala Tyr Asn Gly Thr Ser Met Ala Ser
210 215 220

Pro His Val Ala Gly Ala Ala Leu Ile Leu Ser Lys His Pro Asn
225 230 235 240

Trp Thr Asn Thr Gln Val Arg Ser Ser Leu Glu Asn Thr Thr Lys
245 250 255

Leu Gly Asp Ser Phe Tyr Tyr Gly Lys Gly Leu Ile Asn Val Gln Ala
260 265 270

Ala Ala Gln
275

<210> 55
<211> 182
<212> PRT
<213> Bacillus subtilis

<400> 55

Ala Ala Glu His Asn Pro Val Val Met Val His Gly Ile Gly Gly Ala
1 5 10 15

Ser Phe Asn Phe Ala Gly Ile Lys Ser Tyr Leu Val Ser Gln Gly Trp
20 25 30

Ser Arg Asp Lys Leu Tyr Ala Val Asp Phe Trp Asp Lys Thr Gly Thr
35 40 45

Asn Tyr Asn Asn Gly Pro Val Leu Ser Arg Phe Val Gln Lys Val Leu
50 55 60

Asp Glu Thr Gly Ala Lys Lys Val Asp Ile Val Ala His Ser Met Gly

65

70

75

80

Gly Ala Asn Thr Leu Tyr Tyr Ile Lys Asn Leu Asp Gly Gly Asn Lys
 85 90 95

Val Ala Asn Val Val Thr Leu Gly Gly Ala Asn Arg Leu Thr Thr Gly
 100 105 110

Lys Ala Leu Pro Gly Thr Asp Pro Asn Gln Lys Ile Leu Tyr Thr Ser
 115 120 125

Ile Tyr Ser Ser Ala Asp Met Ile Val Met Asn Tyr Leu Ser Arg Leu
 130 135 140

Asp Gly Ala Arg Asn Val Gln Ile His Gly Val Gly His Ile Gly Leu
 145 150 155 160

Leu Tyr Ser Ser Gln Val Asn Ser Leu Ile Lys Glu Gly Leu Asn Gly
 165 170 175

Gly Gly Gln Asn Thr Asn
 180

<210> 56

<211> 444

<212> DNA

<213> Homo sapiens

<400> 56

gctgaccaac	tgactgaaga	gcagattgca	gaattcaaag	aagcttttc	actatttgc	60
aaagatggtg	atggaactat	aacaacaaag	gaattggaa	ctgtaatgag	atctcttgg	120
cagaatccca	cagaagcaga	gttacaggac	atgatataatg	aagtagatgc	tgatggtaat	180
ggcacaattg	acttccctga	atttctgaca	atgatggcaa	aaaaatgaa	agacacagac	240
agtgaagaag	aaatttagaga	agcattccgt	gtgtttgata	aggatggcaa	tggctatatt	300
agtgcgtgcag	aacttcgcca	tgtgatgaca	aaccttggag	agaagttaac	agatgaagaa	360
gttgcgtgaaa	tgcgtcggga	agcagatatt	gatggtgatg	gtcaagtaaa	ctatgaagag	420

tttgtacaaa tgatgacagc aaag

444

<210> 57
<211> 2058
<212> DNA
<213> *Bacillus circulans*

<400> 57
gcccggata cctcggtatc caacaagcaa aatttcagca ccgacgtcat ctatcaaatt 60
ttcaccgaca ggtttcgg a cggcaatccc gccaacaatc cgaccggcgc ggcgtttgac 120
ggaacctgca cgaacctccg gctgtattgc ggcggcgact ggcagggcat catcaacaaa 180
atcaacgacg gttacctgac cgggatgggc gttaccggca tctggatctc ccagccggtc 240
gaaaacatct acagcatcat caattattcc ggcgtaaaca acacggccta tcacggctac 300
tgggcccggg acttcaagaa gacgaatccg gcctacggca cgattgcgg a cttccagaac 360
ctgatcgccg ccgcgcatgc aaaaaacatc aaagtcat tgcactttgc cccgaaccat 420
acgtcgcccg cctcggtccga ccagccttcc tttgcggaaa acggccggct gtacgataac 480
ggcacgctgc tcggggata cacgaacgat acgcagaacc tggccacca taacggcggc 540
acggactttt ccacgaccga aaacggcatc tacaacacc tgcacatct cggccacctg 600
aaccataaca acagcaccgt ggacgtctac ttgaaggacg cgatcaaaat gtggctggac 660
ctcggcatcg acggcatccg catggatgcg gtgaaggata tgccgttcgg ctggcagaag 720
agcttatgg ctgccgtcaa caactataag ccgtcttta cttcggcga atggttcctg 780
ggcgtaaatg aagtgagccc gggaaaccat aagttgcca acgaatccgg catgagcctg 840
cttgattcc gtttgcaca aaaggtgcgg caggtgtcc gggacaacac cgacaatatg 900
tacggcctga aggcgatgct ggagggctcc gcagccgatt acgcccaggt ggatgaccag 960
gtgacgttca tcgacaacca tgacatggag ctttccacg caagcaatgc aaaccggcgg 1020
aagctggagc aagcgcttgc gttcacgctg acctcgccgc gctcccccgc catttattac 1080
ggcaccgagc agtacatgtc gggcgggacc gatccggaca accggggcgcg gatcccttcc 1140
ttctccacgt cgacgaccgc ctatcaggc attcaaaagc tggcgccgct gcgcaagtgc 1200
aaccggcca tcgcctacgg atcgacgcag gagcgctgga tcaacaacga cgtgctcatt 1260

tatgagcgca aattcggcag caacgttgcc gtcgttgcgg tcaaccgcaa tttaaacgcg	1320
ccggcttcca tttcggact tgtcacttcc ctgccgcaag gcagctacaa cgacgtcctt	1380
ggcgcccttc tgaacggcaa cacgttatcg gttaggctccg gcggggccgc ctccaatttc	1440
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<210> 58
 <211> 1197
 <212> DNA
 <213> *Bordetella pertussis*

<400> 58	
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<210> 59
 <211> 825
 <212> DNA
 <213> *Bacillus amyloliquefaciens*

<400> 59	59					
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 <212> DNA
 <213> *Thermus thermophilus*

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<210> 61
 <211> 588
 <212> DNA
 <213> *Escherichia coli*

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